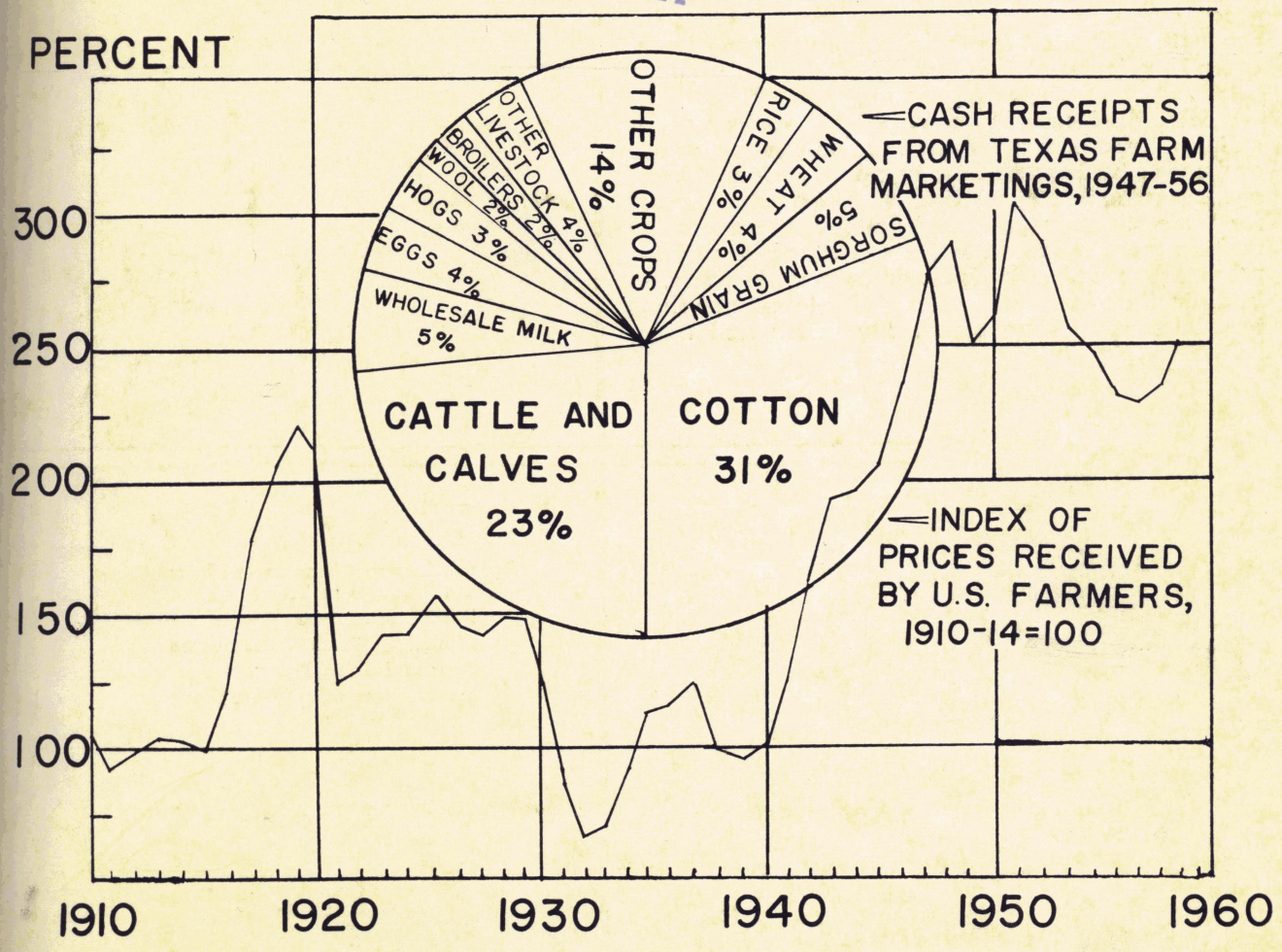
ULLETIN 946

DECEMBER 1959

FACTORS AFFECTING TEXAS FARM COMMODITY PRICES AND INDEX COMPUTATION METHODS, 1910-58



TEXAS AGRICULTURAL EXPERIMENT STATION

R. D. LEWIS, DIRECTOR, COLLEGE STATION, TEXAS

IN COOPERATION WITH THE U. S. DEPARTMENT OF AGRICULTURE

FOREWORD

This publication provides price information for farmers, workers in agriculture who are concerned with operations and for persons in business and industry associated with farming.

Agriculture today includes the farmers as well as the industries which supply productive resources to farmers and the industries which assemble, process, market and distribute farm products. It is vastly different from the agriculture of a century ago when most commodities consumed by farmers were grown or produced on the farm and most products sold commercially went to the consumer in virtually the same form as when they left the farm. The increasing complexity of farming and related businesses due to technological developments, and the greater rewards from increasing specialization in production, account for the changing nature of our overall agricultural industry.

With the increasing complexity of modern agriculture, there has developed an increasing need and use of basic price data, seasonal price patterns, cyclical price behaviour and long-term price trends for understanding problems the industry faces in making more reliable decisions in operations. The present publication is designed to provide workers in agriculture in Texas with such basic data on factors influencing farm commodity prices and their behaviour.

CONTENTS

Factors Affecting Texas Farm Commodity Prices and Index Computation Methods, 1910-58

J. A. Kincannon and G. B. Strong*

PRICE RELATIONSHIPS GREATLY CONCERN THE farmer. Each farmer produces a product or several products that he hopes will give him an income at some level above the cost of production.

In recent years, the impact of vertical integration in almost all phases of agriculture and the importance of agribusiness expansion and development have necessitated a clear, extensive and readily available program for the entire field of prices.

The principal objective of this study is to contribute to a better understanding of some of the factors that affect prices received for certain Texas farm commodities important to the agricultural industry of the State. An index of seasonal variation of farm prices for these commodities and a zone of price expectancy were established. With a knowledge of these two concepts, a producer might, by comparison with the established norm of the period on which these indexes of seasonal variations and price expectancies were computed, be in a better position to approximate the price range of a commodity for any particular month. It often is profitable to know what the seasonal pattern might be for a particular commodity in a certain month and have an estimate of the expected price. Some of the possible causes for these price behaviors are given. Reasonable bases for determining the best time to store or sell a product are presented for 11 major Texas farm commodities.

To supplement seasonal price behavior and price expectancy for these commodities, which account for most of the farm income of the State, prices received and price indexes also were computed for all important Texas farm commodities. These are presented in MP-401, "Prices Received by Texas Farmers and Price Index Numbers, 1910-58."

Texas and U. S. index numbers of prices received for all farm products, index numbers of Texas farm prices received for crops and for all livestock and livestock products and index numbers of prices received and U. S. prices paid are shown graphically. Figures 1 through 3 illustrate the relative changes that have taken place during the past five decades and indicate prewar and postwar trends and the seasonal price patterns which have prevailed for agricultural commodities in Texas and the United States since 1910.

SEASONAL PRICE CHANGES OF MAJOR FARM PRODUCTS IN TEXAS

Farm commodities produced by Texas farmers are harvested seasonally, but consumers desire a supply of these commodities the year round. The seasonal market characteristics of farm products necessitate storage of nonperishable products to meet consumers' needs throughout the year. Some products can be stored easily and inexpensively, while others that are highly perishable are more difficult and costly to store. Consequently, prices of most farm commodities vary throughout the year by the cost of storing from one production season to the next and, in the case of perishables, by variation in the cost of production between areas and the cost of transportation to distant markets. A reasonably clear knowledge of the seasonal aspects of a particular commodity is essential; the producer can make wiser decisions relative to the proper time to store or

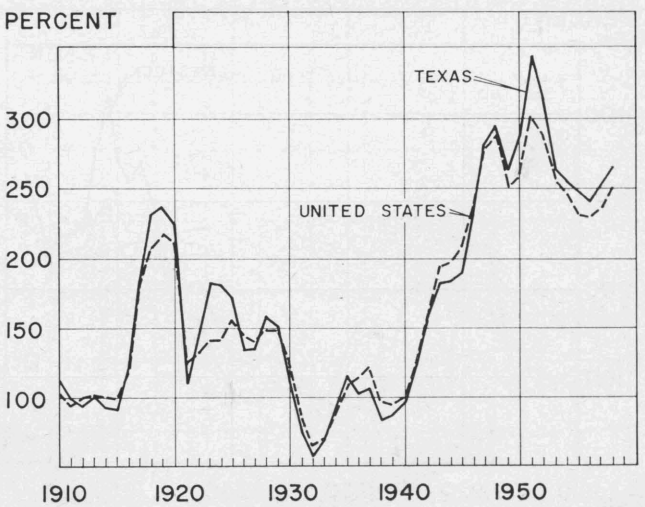


Figure 1. Index numbers of prices received by farmers for all farm products, Texas and United States, 910-58. Base period: 1910-14 = 100.

*Respectively, assistant professor, Department of Agricultural Economics and Sociology, Texas Agricultural Experiment Station, College Station, Texas; and agricultural statistician, Agricultural Estimates Division, Agricultural Marketing Service, U. S. Department of Agriculture, Austin, Texas.

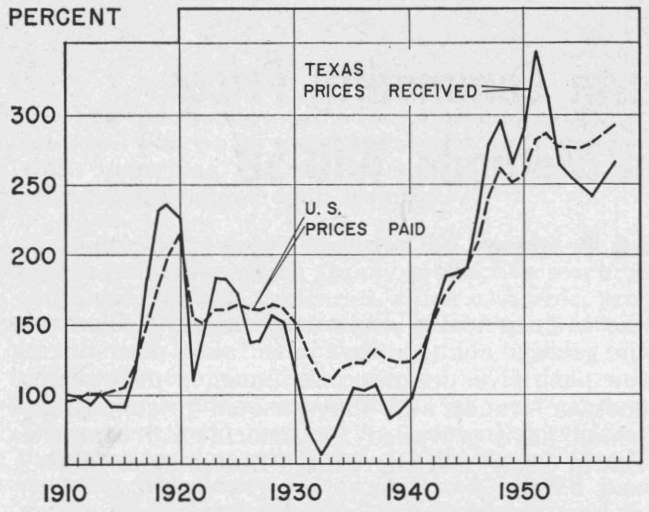


Figure 2. Index numbers of prices received by Texas farmers for all farm products and index numbers of prices paid by U.S. farmers, 1910-1958. Base period: 1910-14 = 100.

to market his products in the optimum price period. However, the seasonality of production and marketing in the United States, or the world as a whole, often has more influence on Texas farm prices than does the Texas production and marketing of these products. Consequently, geographic and climatic conditions in Texas may make it possible for Texas farmers to market their products in optimum high seasonal price periods, or they may be compelled to market certain products during a period of low prices.

It is difficult to establish a set of price-determining criteria for possible market reactions and commodity movements in a free market, while there exist federal price programs covering many commodities produced. These controls alter indirectly the amount of seasonal variation in prices Texas farmers receive for their commodities when price ceilings or price floors for farm commodities are in effect. Nevertheless, with an understanding of the seasonal pattern of farm commodity prices in the free market, supplemented by existing price legislation and implications of federal price programs, a farmer is in a much better position to make decisions relative to the proper time to store and to sell the commodities he produces.

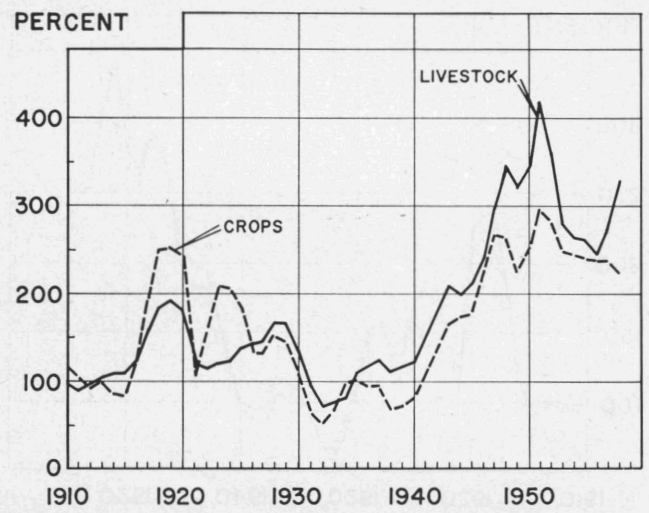


Figure 3. Index numbers of prices received by farmers for all crops and for all livestock and livestock products, Texas, 1910-58. Base period: 1910-14 = 100.

Many factors, such as weather conditions, business activities, trends in farm prices and farm policies here and abroad, alter the seasonal price movement in any particular year. The variation in price patterns for some commodities remains approximately the same year after year while with other commodities the variation is pronounced. Therefore, the average adjusted seasonal variation for Texas farm commodities should be applied in any one year only after adjustments for current as well as probable future changes in economic conditions are made. Any particular analysis made on past years and a forecast of the future made from the model of these past years is a relative concept and should be relied on with discretion. (Indexes of seasonal price variation for 11 major Texas farm commodities were developed using weighted seasonal average monthly prices for the 1947-56 period, Figures 4-14. The prices were adjusted for cycles and trends.)

The zone of price expectancy was calculated for 1947-56 to afford a measure of the monthly variation in prices from the seasonal average price for the 10-year period. This zone gives the range of the average seasonal price that can be expected for any particular month, in approximately 7 out of 10 years.

Definition of Zone of Price Expectancy

The amount of variation in the price, for a given month, from the average price prevailing in that month for the 10 years, 1947-56, was computed as follows: If the average price for a month was 120 percent of the average annual price and the index of price variation was 5 percent, this would mean that the price in that month varied between an index of 115 and 125 in approximately 7 out of 10 years. The narrower the value of the index of the price zone, the greater is the stability and closeness of the monthly seasonal price to the average price for the 10-year period. Conversely, if the value is large, the monthly prices in individual years varied considerably from the average monthly prices.

Marketing Farm Commodities

Most farm commodities are produced and are ready for market within a very short time after harvesting. Prices usually are lowest at the time of harvest and gradually increase as the season progresses. This increase usually amounts to the

cost of storage and other incidental expenses entailed in holding the commodity to the next season. There is no definite rule regarding whether to store commodities in any 1 year because economic conditions may vary from year to year. The most profitable time to store, however, is in periods of rising prices or in seasons of high production. Before anyone can store a commodity, adequate storage facilities must be available. These facilities can be private or public; but regardless of the type, it may not pay to store unless the anticipated price and possible future economic conditions will be such that the cost of storage, insurance and interest on the storage investment will be offset by an increase in the price received at the time the commodity is marketed.

Seasonal Price Patterns

The average seasonal variation of prices of major farm commodities grown in Texas during 1947-56 are reviewed following. The broken lines (price zone) represent the zone of price expectancy which can be expected in about 7 out of 10 years. These indexes of seasonal variation for the commodities discussed do not establish an accurate and foolproof guide in making decisions as to the optimum time to sell or to store. Inasmuch as an index points out the months of rising and falling prices, prices above normal and prices below normal, it does not necessarily reflect what will happen now and in future months. However, weather conditions, international relations, domestic demand, producers intentions and general economic conditions have to be compared with conditions existing during the base period (1947-56), if the index is to serve as a reasonably accurate guide for estimating future prices. The Korean war affected economic conditions and, therefore, prices of some farm commodities were much higher and perhaps others were not noticeably affected. However, in establishing a 10-year base period from the postwar years, the 1947-56 period affords as good an average balance of economic conditions and physical factors as any decade during 1946-58. Rice, for example, is dependent to a large extent upon foreign markets and therefore rice prices were higher immediately following the Korean war than they perhaps would have been had rice production in Asia not been dislocated by the Korean war. On the other hand, many farm commodity prices were no higher during and immediately after the Korean war than before the war.

In the final analysis economic, physical and biological factors must be weighed and adjusted on the basis of acquired knowledge, experience and value judgments when comparing time periods as a basis for making decisions.

Livestock and Livestock Products

The livestock industry plays a vital and necessary part in maintaining the favorable economic status of the agricultural industry of the State. Cash receipts from livestock and livestock products during 1947-56 amounted to about 43 percent of total cash receipts from all farm commodities in Texas. They averaged a little over 870 million dollars annually. Beef cattle, calves, hogs, wholesale milk, eggs, commercial broilers and wool were the livestock and livestock products considered in this seasonal variation study. These seven commodities accounted for 89 percent of total receipts from livestock and livestock products and 39 percent of cash receipts from crops, livestock and livestock products. Out of the 89 percent which the 7 livestock commodities accounted for, cattle and calves accounted for 60 percent, wholesale milk for 14 percent, eggs for 9 percent, hogs for 8 percent, wool for 4 percent and commercial broilers for 5 percent.

The seasonal variation for prices and the zone of price expectancy for livestock and livestock products, are discussed singly following. The difference between the lowest and highest index numbers of seasonal variation in prices for each commodity is converted to dollars by multiplying this difference by the centered average annual price.

BEEF CATTLE

Beef cattle prices followed a uniform pattern throughout 1947-56, Figure 4, remaining above normal for the first half of the year and below normal for the last half. Prices rose consistently from November to April, after which they declined steadily through October. Prices varied less from November through January than for any other period, reflecting a slowing down of beef cattle moving into the market as compared with the peak marketing months just preceding November. The months of largest variation in prices are from May through November, thus reflecting large supplies being marketed, but rather irregularly. The movement of cattle into the markets is influenced largely by ranchmen's decisions as to the optimum time to feed and mar-

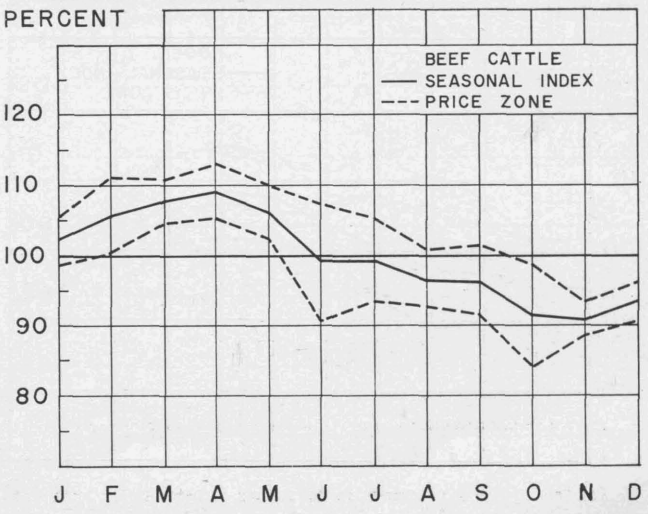


Figure 4. Beef cattle: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

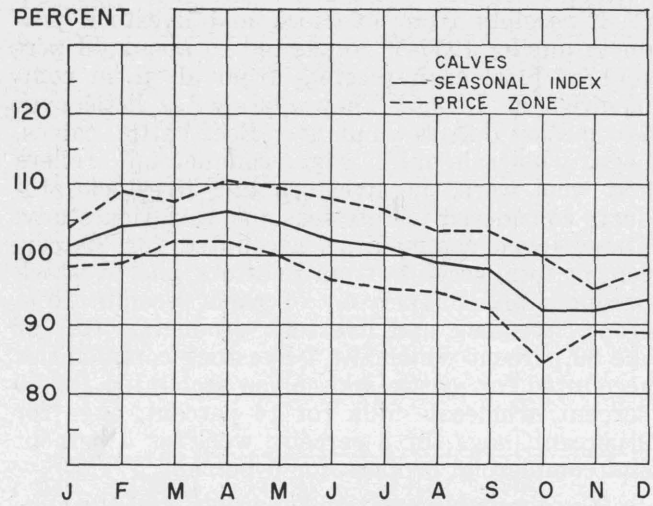


Figure 5. Calves: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

ket and by the composition of marketings. The largest drops in prices were between mid-May and mid-June and again between mid-September and mid-October, which were an indication of the peak marketings of spring and fall cattle. Prices of beef cattle usually reached a low in November of 91 and advanced to a high of 109 in April, a difference of 18 points, or $3.62 per hundredweight.

CALVES

Calf prices followed practically the same pattern as beef cattle prices, but with much less variation, Figure 5. Calf prices usually reached a low of 92 in November and a high of 105 in April, a difference of 13 points, or $2.92 per hundredweight. This was only about two-thirds of the variation in cattle prices. The possible differences between the price pattern followed by calf prices and that followed for beef cattle was the large price drop between mid-May and mid-June for beef cattle while the only perceptible drop from the average in calf prices was between mid-September and mid-October. This indicated that the heavier supply of calves moved into the market in the fall, with the largest numbers reaching the markets in October. It is not necessarily true that a similar price pattern prevailed in October in any particular year or will prevail in the future. One other characteristic of calf prices that differed from beef cattle prices is that the variation in prices for calves in December was considerably more than beef cattle prices. The smallest variation in prices for calves was in November, January and March. Beef cattle and calf prices for Texas had only one seasonal high and one seasonal low. This is particularly worthy of note inasmuch as cattle and calf prices usually are considered to have two seasonal lows and two seasonal highs. This shift in the pattern was perhaps attributed to the strong demand for feeder and stocker cattle and the desire to enlarge breeding stocks during this period. These factors and the strong domestic demand for consumption stabilized, and in some instances prevented, extreme price fluctuations which had previously prevailed in the cattle industry.

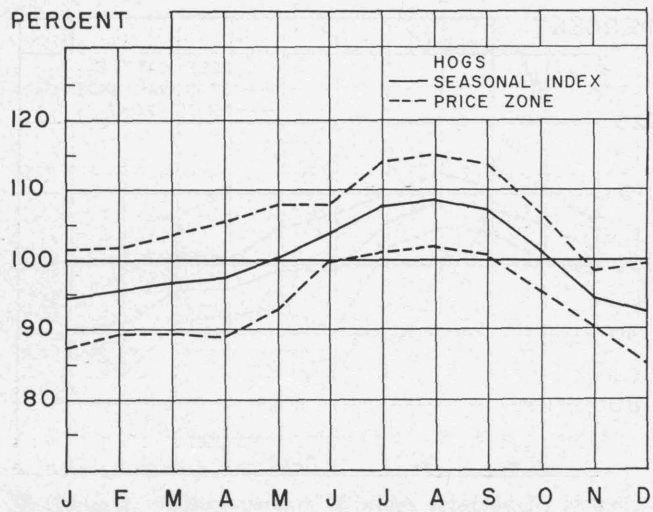


Figure 6. Hogs: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

HOGS

Hog prices followed a uniform pattern throughout the year. They varied more than calf prices, but less than beef cattle prices, Figure 6. The variation differed from that of cattle and calves in that hog prices were above normal during the summer and below normal in the late fall and early spring. Hog prices had one seasonal high and two seasonal lows. Hog prices varied less in October, November and June and had the greatest variations in April and August, which reflect heavier fall farrowings and consequently larger spring marketings.

However, the variation in prices for hogs was nearly as large in December and January as for August. Hog prices, based on the 10-year average for the seasonal index of prices, reached a low of 92 in December and a high of 108 in August, a difference of 16 points or $3.23 per hundredweight. The high prices for hogs during July, August and September seemed to be more consistently true in any particular year than that for cattle and calves. This perhaps is a result of fewer hogs being marketed during the summer irrespective of the supply that may be available for the market in any 1 year. Too, hog producers can go in and out of production more rapidly than cattle producers. Consequently, control over the supply of calves or slaughter cattle available for market in any particular year or month is not nearly so flexible as the control of hogs available for market in any particular season.

WHOLESALE MILK

Wholesale milk prices followed a uniform seasonal price pattern, having two seasonal highs and one seasonal low, Figure 7. The prices re-

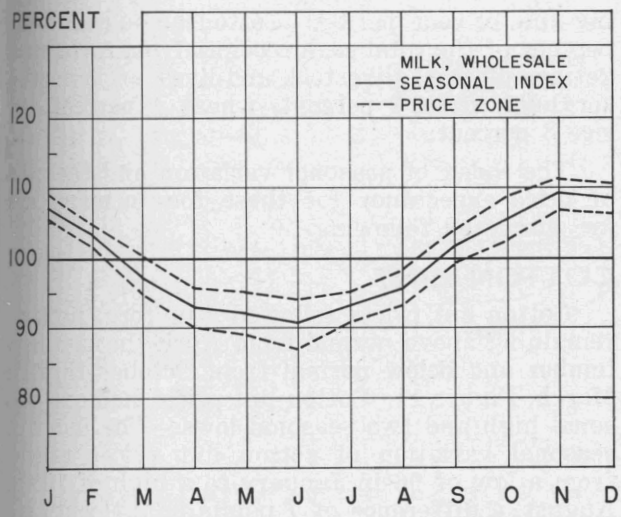


Figure 7. Wholesale milk: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

main above normal from September through February. Milk prices declined uniformly from a high of 109 in November to a low of 91 in June, a difference of 18 points or $1.08 per hundredweight. An interesting characteristic of the zone of price expectancy for wholesale milk is the fact that the zone is extremely narrow and uniform throughout the year with the exception of May, June and October. This perhaps is attributed to the strong postwar demand for milk. The technological innovations in production, high proportion of total sales by Texas producers made under federal order regulations during recent years, management practices within dairy organizations and the overall efficiency of state and national milk marketing organizations also have contributed to the uniform variation in milk prices. Other factors which caused the supply of milk to be held uniformly at the level of consumer demand were efficiency in milk production and marketing, and the base plans used in the six federal orders in Texas. Percentage utilization of milk according to fluid and manufacturing also is an important factor affecting month-to-month milk prices.

EGGS

Egg prices followed closely the pattern of wholesale milk, but with considerably more variation from the average than did milk prices, Figure 8. Egg prices also had two seasonal highs and one seasonal low. Prices remained above average from August through January and below normal for the remaining months. Prices increased uniformly from June until January, falling rapidly through March and declining gradually from March through June. The index of seasonal price variation for eggs reached a low of 83 in June and a high of 129 in December, a difference of 46 points, or 19 cents per dozen. The wide variation in egg prices is related directly to the lack of control over supply relative to domestic demand. This relationship between supply and demand is complicated because of the

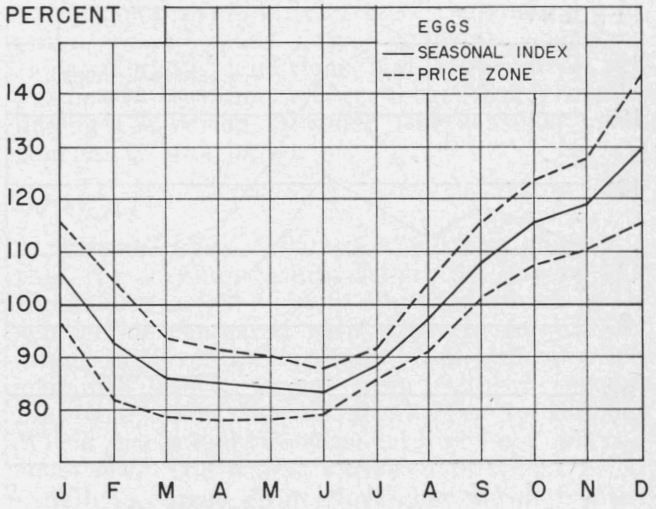


Figure 8. Eggs: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

risk and uncertainty in egg production and many firms leaving and entering the industry. Another important factor contributing to the variation in egg prices is related directly to feed supply and prices in any particular season or year.

High operating costs, storage facilities and a guaranteed market for eggs as they are produced should be recognized before large-scale egg producing operations are undertaken.

COMMERCIAL BROILERS

Broiler prices followed an irregular pattern, having two seasonal highs and three seasonal lows, Figure 9. Prices, however, did remain above normal from March through September, reaching a low of 93 in December and a high of 108 in August. The difference in the low and high of these seasonal indexes of price amounted to 15 points or 4 cents per pound. The strongest factors, perhaps, accounting for the irregular pattern of broiler prices are: variations in the sup-

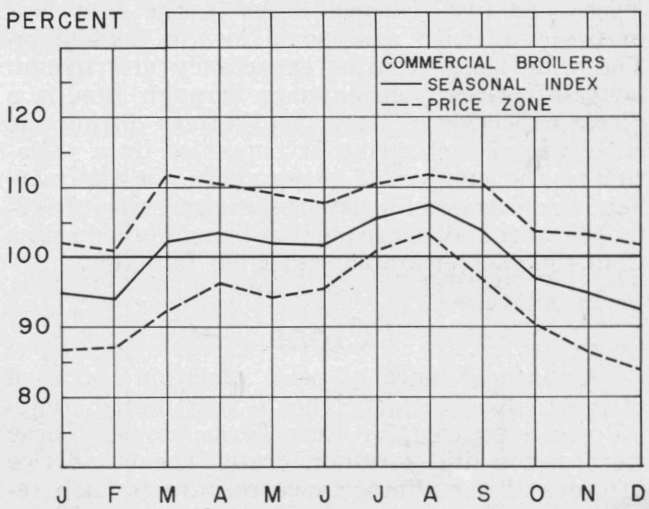


Figure 9. Commercial broilers: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

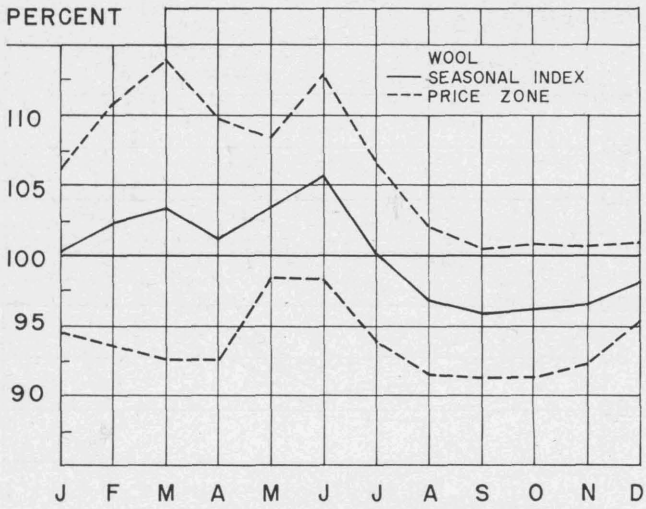


Figure 10. Wool: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

ply available for the market, an irregular supply of available feed, fluctuations in feed prices and many substitute foods for chicken. The widest zone of price expectancy occurred from October through May, reflecting extreme variation in domestic demand through the winter and early spring. This was, perhaps, attributed to a stronger demand for beef and pork during the colder months.

WOOL

The average seasonal variation in wool prices followed a symmetrical pattern, remaining above normal for the first half of the year and below normal for the last half, Figure 10. The index of average seasonal variation of wool prices ranged from a low of 96 in September to a high of 106 in June. This difference amounted to 10 points or 6 cents per pound. The zone of price expectancy remained uniform and relatively narrow from June through December, but wide and irregular from January through June. Wool prices had two seasonal highs in the first half of the year with a seasonal low in September. The wide zone of price expectancy and irregularity of prices from January through June is a direct reflection of heavy marketings during the early winter and spring accompanied by a variation in the number of sheep shorn for the market. Spring wool prices represent sale of 12-month wool and, consequently, bring higher prices than the shorter staple sold from fall clips.

Crops

A seasonal index of price variation and zone of price expectancy for the 10-year period, 1947-56, was computed for four Texas crops. These were cotton lint, sorghum grain, wheat and rice in order of their importance relative to cash receipts from marketings by Texas farmers. These four cash crops accounted for 76 percent of the total receipts from crops marketed in Texas during the 10-year period. Cotton amounted to 31 percent of the total cash receipts from farm marketings of crops, livestock and livestock products, sorghum grain 5 percent, wheat 4 percent and rice 3 percent.

The index of seasonal variation and the zone of price expectancy for these four commodities are discussed following.

COTTON LINT

Cotton lint prices followed a uniform pattern, remaining above normal from April through September and below normal from October through March, Figure 11. Cotton lint prices had one seasonal high and two seasonal lows. The index of seasonal variation of cotton lint prices ranged from a low of 96 in January to a high of 103 in August, a difference of 7 points or 2.4 cents per pound for the 10-year average. The 2.4 cents per pound for cotton lint, which represented the largest range in price below and above the season average, was small relative to the average seasonal price at which cotton sold during the period considered. The widest range of price variation below and above the average for cotton lint was from July to October. The wider range and the higher degree of irregularity in the variation of prices from the average during July to January would be expected for cotton since these were the months of cotton harvesting in Texas. The seasonal price drop from the months of early harvest is attributable largely to the shift from the high quality cotton of the Lower Valley in July, progressing through the clean-up of harvesting of shorter staple and often weather-damaged cotton on the High Plains. The smallest variation in the average price was in February, March and April, also in October, with the smallest in March. There are many factors, such as international import and export laws, foreign demand, synthetics, wool, mohair, weather, economic conditions, business activities and government programs, which can weaken this seasonal index pattern as a fore-

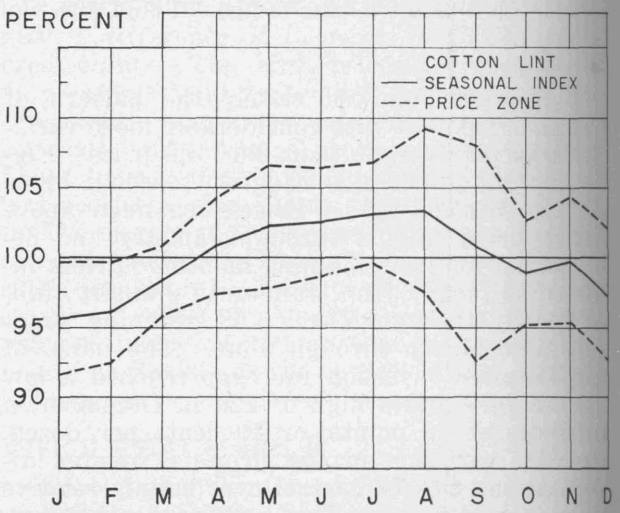


Figure 11. Cotton lint: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

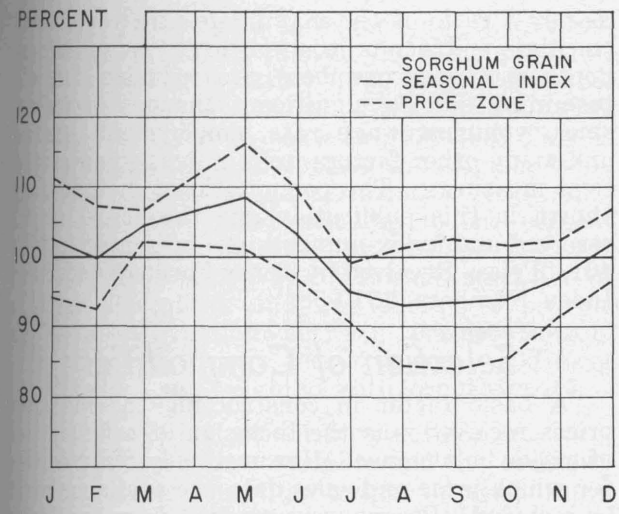


Figure 12. Sorghum grain: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

cast of future price trends and as a guide in ascertaining the optional time to store or sell cotton.

SORGHUM GRAIN

Sorghum grain prices followed a uniform pattern, remaining above normal from mid-November to mid-June and below normal for the remaining months, Figure 12. Sorghum grain prices were at normal only three times during this period. These three normal periods of seasonal variations in prices were in February, between mid-June and mid-July and between mid-November and mid-December. Sorghum grain prices had two seasonal highs and one seasonal low. The two seasonal highs were in January and May, while the low was in August.

The index of seasonal variation in prices of sorghum grain reached a low of 93 in August and a high of 109 in May. This was a difference of 16 points or 36 cents per hundredweight. The widest spread above and below the index of seasonal price variation was from August through October. This was to be expected in view of the heavy marketings of sorghum grain during these months and competitive feed grains reaching the market. This relation will vary depending on the supply of sorghum grain as well as the potential supplies of competing grains. The smallest variation in price is in March when the smallest quantity is moving into the market and the demand is relatively stable. Usually the most profitable time to store sorghum grain is when the supply is large or prices are rising. Therefore, the best time to store would be between mid-October and mid-December and to sell between mid-February and mid-May. The least profitable time to store sorghum grain, relative to the seasonal price pattern, would be between mid-May and mid-August, even though the farmer has to store at the time of harvesting. Decisions concerning when to store or to sell should be compared with average conditions prevailing relative to the general economy, general price levels, economic considerations, climatic conditions and government programs closely approaching those that prevailed during the period in which this seasonal variation study was based.

WHEAT

Wheat prices followed a pattern similar to that for sorghum grain, Figure 13, except that the index reached a low in June and a high in December, as compared with a low in August and a high in March for sorghum grain. Wheat prices remained above normal from October through May and below normal from May to October. Wheat prices had two seasonal highs and one seasonal low. The widest variation in wheat prices usually occurred from November through April with the widest occurring in March and a small variation from April to October. The variation in wheat prices would be expected to be somewhat more uniform and smaller than with sorghum grain because of marketing quotas and acreage allotments which have been in force for wheat for most of the time during 1947-56 and the fact that wheat is sold primarily for human consumption, while sorghum grain is sold mostly for livestock feed. Consequently, variations in the demand for wheat for human consumption during this period were much less subjected to variations in demand than was true for sorghum grain as feed for livestock.

ROUGH RICE

Rough rice prices did not follow as uniform a pattern as did wheat and sorghum grain, Figure 14. The zone of price expectancy particularly was wider and more irregular than it was with wheat. This would be expected for rice during this period since rice was subject to acreage allotments and marketing quotas in only 2 years, 1955-56, during the period considered. The sta-

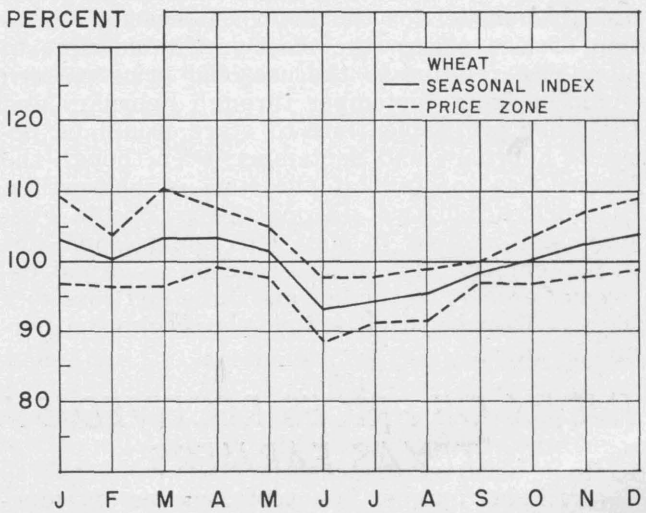


Figure 13. Wheat: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

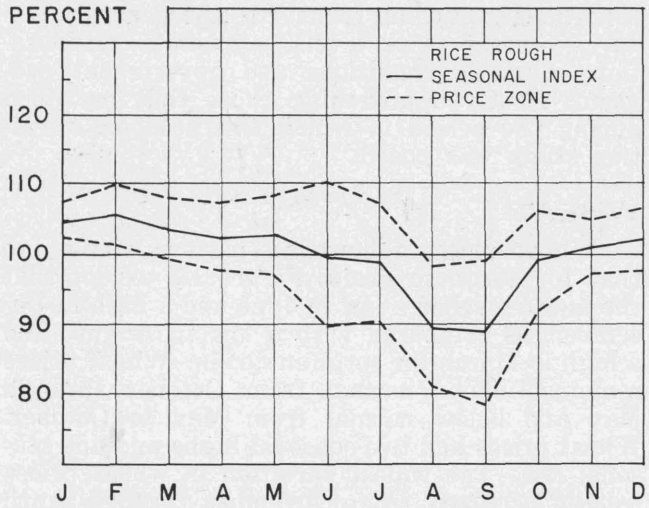


Figure 14. Rough rice: index of seasonal variation of Texas farm prices and zone of price expectancy, 1947-56.

bility in rice prices during this period hinged almost entirely on the stability of foreign demand for United States rice. This is particularly true in view of the constant level of domestic demand. Rice was under government support prices during 1947-56 and the free market price was higher than the support price except in 1951, 1954 and 1955. The wider variation in the zone of price expectancy for rice as compared with wheat was primarily a result of the difficulty of adjusting supply to the variation in foreign demand for United States rice. Another factor contributing to this difference is the greater number of balancing demand forces for wheat as a consequence of the many wheat by-products as compared with rice. The index of seasonal variation in rice prices reached a low in September of 89 points, and a high in February of 106 points. This difference amounted to 17 points or 90 cents per hundredweight for rice. This amounts to $1.46 per barrel which can reduce profit relative to the high cost of production for rice in periods of rising costs of production. On the basis of the established model for the index of seasonal variation of rice prices, the most profitable time to store rice relative to the seasonal price pattern would be from September through February and the least profitable time to store would be between February and September, even though the farmer has to store at the time of harvesting. Rice prices had two seasonal highs, one in February and another in May with one seasonal low in September. Rice prices reached a normal between October, November and June and rose to a high in February and fell slowly reaching a normal in June.

INDEX OF PRICES RECEIVED BY TEXAS FARMERS

An index number is a useful means of reducing large numbers to simple fractions with a common base or denominator. An index number is merely a ratio of the magnitude of a variable at one time or place or position to its magnitude at another. Index numbers are valuable for determining quickly significant changes in prices, sales, volumes, wage rate, employment, income and many other factors used in developing statistical measures. The computational methods are shown in this publication and the actual prices received and index numbers are presented in MP-401, "Prices Received by Texas Farmers and Price Index Numbers, 1910-58."

Selection of Commodities

A basic factor in constructing the index of prices received was the inclusion of commodities of major importance. However, only commodities for which price and sales data are available could be included. Pecans were omitted from the index because price data are limited to the season average price which does not become available until December. Much of the crop has been sold by that date. Prices received for forest products and greenhouse and nursery products could not be included since basic price and sales data are lacking.

Additional commodities were brought into the index as they became important and price and sales data were available. For example, sorghum grain prices were brought into the feed grain and hay index in January 1917. Sub-crop groups were expanded at the beginning of 1924 to include fruits and commercial vegetables for fresh market. In the latter group, winter lettuce was added in October 1946 and the early fall lettuce crop was picked up in January 1948.

Turkey prices were first included in the poultry and egg index in June 1933. For earlier years, turkey was a Thanksgiving or Christmas dish, and prices were available for only a few months. Because of diminishing importance, butter was dropped from the dairy index in October 1946.

Selection of Base

Amendments to the parity legislation included in the Agricultural Acts of 1948 and 1949 required shifting the base period for the index of prices received by farmers from August 1909-July 1914 to January 1910-December 1914. This shift was made to coincide with the base used in constructing the national prices paid index. Procedures used in constructing the national index were followed in revising the index of prices received by Texas farmers.

Structurally, the revised index of prices received by Texas farmers is a modified fixed weight aggregative type with the base period January 1910-December 1914 taken as 100 percent. Three weight base periods were used: 1924-29, 1935-39 and 1948-53.

For January 1910 to June 1933, prices were weighted by average sales during the 6 years,

1924-29. Prices and cash receipts were more stable during 1924-29 than in any other period of comparable length during 1910-35. From June 1933 through September 1946, prices were weighted by average sales in 1935-39. This is the period used in constructing the original index of prices received by Texas farmers. Beginning in October 1946 and continuing to the present time, prices were weighted by average sales for 1948-53. This period was taken as indicative of postwar agriculture and was chosen to provide an even distribution between pre-drouth and drouth years. A more recent period would have been too heavily weighted with drouth years.

Use of shifting weight base periods is a compromise between fixed weights and the necessity for recognizing long-time shifts in agricultural production. Indexes computed using the various weight base periods are linked together to provide a continuous series with 1910-14 = 100. Methods used in linking these indexes are explained on page 12.

Weight base periods used in constructing the national index of prices received by farmers are: 1924-29, from January 1910 to January 1935; 1937-41 from January 1935 to August 1952; and 1953-57 from September 1952 to date.

Grouping of Commodities

Farm products can be grouped on the basis of their general use or production requirements. An overall picture of agricultural price movement comes into focus by observing price changes for a few major groups of products. The more detailed task of analyzing price movement for each commodity is time consuming and fails to give either the trend or level of prices received for all farm products.

Groups and subgroups used in the original index follow the groupings for the national index and generally were retained. Instead of a "wool" group as carried in the original index, "wool and mohair" now comprise the comparable livestock products group. The "truck crops" index is now referred to as "commercial vegetables for fresh market" in keeping with the terminology used currently in referring to these crops.

Commodities were brought into the index when their importance in relation to cash income sufficient to warrant their inclusion and when adequate price and marketing weight data became available. For methods used in adding commodities, see page 14.

Following are the two major groups and 11 subgroups used in the revised index of prices received by Texas farmers with the commodities in each:

GROUP	COMMODITY
Crops	
Cotton	Cotton lint
Food grains	Wheat, rice
Feed grains and hay	Corn, oats, barley, sorghum grain, hay
Oil-bearing crops	Cottonseed, peanuts
Potatoes and sweet potatoes	Potatoes, sweet potatoes
Fruits	Oranges, grapefruit, peaches
Commercial vegetables for fresh market	Cabbage, winter; carrots, winter; onions, early spring, late spring; spinach, winter; tomatoes, early spring, late spring, late fall; watermelons, early summer; lettuce, winter, early fall
Livestock and Livestock Products	
Meat animals	Beef cattle, calves, hogs, sheep, lambs
Poultry and eggs	Chickens, turkeys, eggs
Dairy products	Milk, wholesale; milk, retail; butterfat in cream, butter (dropped in October 1946)
Wool and mohair	Wool, mohair

Thus, prices received for 26 crops are combined into an all-crops index. In like manner, prices received for 14 livestock and livestock products items were combined. These two major groups — all crops, livestock and livestock products—were combined into an all-farm products index. Commodities used in constructing this index account for more than 95 percent of the State's cash income.

Commodities Having Incomplete Monthly Price Estimates

For short-season crops, such as commercial vegetables and fruits, marketings occur in only a few months. For potatoes and sweet potatoes, prices are estimated only for months when sales account for at least 1 percent of seasonal sales. In recent years, nominal prices have been discontinued for cottonseed and peanuts.

A monthly price is needed for each commodity in constructing the index. This involves supplying prices for months having no estimate. In the original index, the season average was supplied for citrus and commercial vegetables. This basic principle has been retained, but modified to limit fictitious fluctuations in the index.

Under certain conditions, use of the price estimated for the last month of the marketing season prevented fictitious advances or declines in periods of no grower sales. For example, growers receive 80 cents per hundredweight for cabbage in May 1950. The season average price received for that crop was only 60 cents. Growers received $1.25 for marketings of new-crop cabbage in October. Use of the May price for months

with no estimated price prevented a fictitious change in the index of prices received for commercial vegetables.

For potatoes, sweet potatoes, cottonseed and peanuts, crops for which prices were available for practically all months, the last monthly price of the marketing season was used generally until the new crop came into production. Historically, the price adopted for the first month of the next marketing year provided a helpful guide in deciding whether to supply the season average or the last monthly price.

Computation of Subgroup Indexes

Table 1 shows basic data used in computing subgroup indexes for January 1910 through December 1958. For each weight base period (1924-29, 1935-39 and 1948-53), the average monthly price was obtained first for each commodity as well as the annual or season average quantity sold. Thus, during the 7 years, 1924-29, the average price of wheat was $1.27 per bushel and the average quantity sold amounted to 23,029,000 bushels. Comparable figures for rice, the other component of the food grain index, are $2.58 per hundredweight and 2,986,000 hundredweight. The average annual aggregate value of wheat and rice sales during this base period was $36,951,000.

Average quantities sold during 1924-29 were used for weighting prices each month from January 1910 through May 1933. For example, the May 1933 computations are shown in Table 2.

Dividing the May 1933 aggregate of $17,610,000 by the base aggregate of $36,951,000 gives an (1924-29=100) index of 47.7 percent. This procedure was followed each month in the January 1910-May 1933 period. The objective, however, was to construct the series of index numbers so that 1910-14=100. Consequently, the index had to be converted from 1924-29=100 to 1910-14=100. This was done by obtaining the January 1910 through December 1914 average of the 1924-29=100 indexes, which was 75.295. To place the 1924-29=100 indexes on the 1910-14=100 level, 100 percent was divided by 75.295, which resulted in a conversion factor of 1.3281. Each of the monthly food grain indexes from January 1910 through May 1933 was adjusted by this factor. In May 1933, for example, the 47.7 percent computed on the 1924-29=100 base was adjusted to 63.4 percent (47.7 percent × 1.3281). A similar procedure was followed for other subgroups except cotton.

Since cotton comprises a separate subgroup, a price relative was computed from the 1910-14 average price. This placed the cotton index on the desired 1910-14=100 base and no adjustment was necessary. Special handling was needed, however, to combine cotton with other crops into an all-crops index. This procedure is explained in the section, "Combining subgroup indexes."

From June 1933 through September 1946, indexes for all subgroups, except cotton, were computed from 1935-39 base data. Starting in October 1946 subgroup indexes were computed from 1948-53 base data. Indexes from each of these base periods were converted to a 1910-14=100 base by applying the appropriate conversion factor. These factors are shown in Table 3 and are explained in the following section.

Selection of Link Dates

As previously stated, three different weight base periods were used in constructing the revised series of index numbers to recognize changes in Texas' agricultural price pattern. It was necessary to link index numbers computed from these three weight base periods to effect a smooth shift when changing from one base to another. Selecting the link date is important. Of primary importance is selection of a month when the two major groups, all crops and livestock and livestock products, are in close agreement.

Original plans were to shift in 1932 from the 1924-29 base to 1935-39. Throughout 1932, the all-crops index was considerably lower than the livestock and livestock products index. It was not until June 1933 that these two major group indexes were within two points of each other. At that time prices were just starting to turn upward following the prolonged depression.

October 1946 was chosen as the date for linking indexes computed from 1935-39 to 1948-53 base. For that month, the all-crops index computed from the 1910-14 = 100 base was 278 and the livestock and livestock products index 273. This five-point spread is more than is desirable but is the minimum in the period between the two base weight periods (1940-47).

Linking and Conversion Procedures

Procedures for converting subgroup indexes from the 1924-29=100 base to the 1910-14=100 base have been explained. Similar procedures are used for converting the all-crops, livestock and livestock products and all-farm products indexes to the 1910-14=100 base.

Appropriate linking factors were computed for connecting indexes calculated on a 1924-29 base with those developed on a 1935-39 base. In like manner, factors were computed for linking indexes from the 1935-39 base with those worked from the 1948-53 base. Table 4 shows the computations involved in developing food grain conversion factors for the 1935-39 and 1948-53 base periods.

The indexes are derived from the "aggregate" and the respective base aggregate shown for food grains in Table 1.

Group	Unit	January 1910 to June 1933			June 1933 to October 1946			October 1946 to December 1958		
		1924-29			1935-39			1948-53		
		Average price	Average quantity sold	Aggregate	Average price	Average quantity sold	Aggregate	Average price	Average quantity sold	Aggregate
Crops		Dol.	Thous. units	Thous. dol.	Dol.	Thous. units	Thous. dol.	Dol.	Thous. units	Thous. dol.
Cotton	Lb.	[1]	Price relative 1910-14 price - $0.11705		[1]	Price relative 1910-14 price - $0.11705		[1]	Price relative 1910-14 price - $0.11705	
Food grains				36,951			29,323			146,866
Wheat	Bu.	1.27	23,029		.856	23,531		2.07	37,234	
Rice	Cwt.	2.58	2,986		1.75	5,246		5.67	12,309	
Feed grains and hay				27,949			20,931			117,423
Corn	Bu.	.950	11,543		.688	15,259		1.58	12,244	
Oats	Bu.	.535	11,115		.375	9,589		.922	9,125	
Sorghum grain	Cwt.	1.46	5,344		1.11	4,430		2.30	33,447	
Barley	Bu.	.711	1,138		.537	531		1.25	549	
All hay	Ton	13.04	186		8.84	185		27.70	435	
Oil-bearing crops				53,274			34,782			127,300
Cottonseed	Ton	32.52	1,570		27.43	1,165		69.99	1,502	
Peanuts	Lb.	.0567	39,124		.0322	87,760		.103	215,290	
Potatoes and sweet potatoes				4,672			3,339			8,724
Potatoes	Cwt.	2.56	844		1.76	796		3.10	1,240	
Sweet potatoes	Cwt.	2.79	900		1.70	1,140		5.44	897	
Commercial vegetables for fresh market				14,533			12,199			41,541
Cabbage, winter	Cwt.	.981	2,416		.793	2,201		1.61	2,229	
Carrots, winter	Cwt.	.826	686		.689	811		1.77	2,320	
Onions, early spring	Cwt.	2.78	1,386		1.45	1,828		4.20	1,803	
Onions, late spring	Cwt.	1.85	150		1.06	685		3.98	271	
Spinach, winter	Cwt.	2.67	877		1.85	1,039		7.84	482	
Tomatoes, early spring	Cwt.	5.23	220		2.22	586		4.54	1,094	
Tomatoes, late spring	Cwt.	4.13	560		2.00	931		6.19	818	
Tomatoes, late fall	Cwt.	4.30	46		2.63	166		6.26	263	
Watermelons, early summer	Cwt.	.644	2,268		.472	2,111		1.03	5,479	
Lettuce, winter	Cwt.		[2]			[2]		4.02	726	
Lettuce, early fall	Cwt.		[2]			[2]		4.25	277	
Fruits				2,686			8,630			11,965
Grapefruit	Box	1.57	605		.537	10,474		1.69	4,456	
Oranges	Box	1.93	78		1.05	1,822		1.89	1,623	
Peaches	Bu.	1.48	1,071		1.05	1,040		2.66	514	
Livestock and livestock products										
Meat Animals				124,214			105,084			605,087
Beef Cattle	Cwt.	6.05	13,494		5.38	12,180		20.25	18,699	
Calves	Cwt.	7.55	2,321		6.40	2,392		23.31	5,768	
Hogs	Cwt.	9.13	2,040		7.59	1,989		20.10	3,171	
Sheep	Cwt.	7.28	378		4.55	951		11.74	1,220	
Lambs	Cwt.	10.29	357		6.50	742		21.99	633	
Poultry and eggs				37,989			33,820			141,365
Chickens	Lb.	.181	63,030		.124	47,707		.275	169,122	
Turkeys	Lb.		[2]		.122	49,244		.297	48,847	
Eggs	Doz.	.267	99,556		.189	115,850		.429	187,292	
Dairy products				37,405			44,610			136,208
Milk, wholesale	Cwt.	3.03	3,767		2.18	8,352		6.10	18,083	
Milk, retail	Qt.	.123	100,500		.102	138,200		.206	93,000	
Butterfat	Lb.	.362	24,827		.250	38,970		.597	7,807	
Butter	Lb.	.362	12,822		.274	9,363			3,489	
Wool and mohair				18,537			23,974			41,847
Wool	Lb.	.344	33,844		.245	71,163		.644	49,332	
Mohair	Lb.	.617	11,175		.466	14,032		.793	12,708	

[1]No weight shown since cotton is treated as a separate group.
[2]Commodity not included this base period.

TABLE 2. COMPUTATION OF AGGREGATE VALUE OF FOOD GRAIN SOLD IN 1924-29 AT PRICES RECEIVED IN MAY 1933

Commodity	Unit	Prices received by farmers, May 1933	Average quantity sold, 1924-29	Aggregate value
		Dollars	Thousand	Thousand Dollars
Food grain group				
Wheat	Bushels	.60	23,029	13,818
Rice	Cwt.	1.27	2,986	3,792
				17,610

TABLE 3. FACTORS FOR CONVERTING FROM WEIGHT BASE TO 1910-14 = 100

Commodity group	Conversion factor		
	1924-29 to 1910-14	1935-39 to 1910-14	1948-53 to 1910-14
Cotton lint	19.304[1]	9.945[1]	32.66[1]
Food grains	1.3281	.88782	2.3754
Feed grains and hay	1.0154	.73382	1.6281
Oil-bearing crops	1.6145	1.2819	3.3892
Potatoes and sweet potatoes	1.3669	.90147	2.3246
Commercial vegetables[2]	1.5928	1.0386	2.6281
Fruits[2]	1.5928	.85551	2.3699
All crops	1.5928	.86741	2.6293
Meat animals	1.3598	1.1725	4.1246
Poultry and eggs	1.5877	1.1224	2.5849
Dairy products	1.5082	1.1648	3.0683
Wool and mohair	2.1620	1.5422	3.6285
All livestock and products	1.4695	1.1541	3.4390
All commodities	1.5565	.97048	2.9363

[1]Index is a price relative (1910-14 = 100) using 1910-14 average price of 19.304 cents per pound. The 1935-39 average is 9.945 cents per pound and the 1948-53 average is 32.66 cents.

[2]Commercial vegetables and fruits brought into index January, 1924 at level of all crops.

TABLE 4. DATA USED TO COMPUTE FACTORS FOR LINKING WEIGHT BASE PERIODS (FOOD GRAINS)

Month and year	Weight base period	Aggregate	Index	Percent	Old conversion factor	New conversion factor
June 1933	1924-29	18,109	49.0			
				$\frac{49.0}{73.3}$ = 66.849 × 1.3281 = .88782		
June 1933	1935-39	21,489	73.3			
October 1946	1935-39	71,308	243.2			
				$\frac{243.2}{90.9}$ = 267.55 × .88782 = 2.3754		
October 1946	1948-53	133,514	90.9			

Similar procedures were used for each of the subgroup indexes (except cotton), the two major groups of all crops and livestock and livestock products, and the "all-farm products" group. Factors used to convert the respective group indexes computed on each of the three different bases to a 1910-14=100 base are shown in Table 3. Cotton indexes are price relatives worked from the 1910-14 average price and no conversion factors are needed.

Combining Subgroup Indexes

Table 5 shows the basic data for combining subgroup indexes into two major group indexes (all crops and livestock and livestock products). Weights for combining these two major groups into the all-farm products index also are shown. Indexes for the two major groups (Figure 3) and all farm products are computed from the appropriate base *before* converting to the 1910-14=100 base. Cash receipts are used for weights in combining subgroup indexes.

Table 6 and Table 7 show the actual computations for May 1933 for the all-crops (Table 6) and the all-farm products indexes (Table 7).

The all-crops conversion factor (1.5928) was developed by first obtaining the January 1910 through December 1914 average of the 1924-29=100 indexes which was 62.782. Secondly, 100 percent was divided by 62.782 to give the factor of 1.5928.

Since cotton is treated as a separate group, this crop required special handling in computing the all-crops index on the 1924-29, 1935-39 or 1948-53 base. In Table 6, the 41.4 percent is a price relative computed from the 1924-29 average \$0.19304 (\$0.08 ÷ \$0.19304 = 41.4). For other months of the period studied, price relatives computed from the respective base price shown in Table 3 were used in computing the all-crops index.

Adding Commodities

The following commodities were added to the index during the revision at the time specified:

COMMODITY OR GROUP	DATE
Sorghum grain	January 1917
Fruits	January 1924
Commercial vegetables for fresh market	January 1924
Turkeys	June 1933
Lettuce, winter	October 1946
Lettuce, early fall	January 1948

The most favorable time to introduce a commodity into the index is at the beginning of a weight base period since the effect of the new commodity is taken care of in computing the new weight base aggregate. Only turkeys and winter

TABLE 5. GROUP WEIGHTS BY PERIODS FOR INDEX OF PRICES RECEIVED BY TEXAS FARMERS

Commodity group	1924-29 base period					1935-39 base period					1948-53 base period				
	Average cash receipts			Weights		Average cash receipts			Weights		Average cash receipts			Weights	
	Commodities included in index	Commodities excluded from index	Total	For major groups	For all commodities	Commodities included in index	Commodities excluded from index	Total	For major groups	For all commodities	Commodities included in index	Commodities excluded from index	Total	For major groups	For all commodities
	— — Thousand dollars — —			— Percent —		— — Thousand dollars — —			— Percent —		— — Thousand dollars — —			— Percent —	
Crops															
Cotton	437,322	—	437,322	77.3	55.8	164,568	—	164,568	60.8	34.5	653,899	—	653,899	58.8	32.5
Food grains	33,173	—	33,173	5.9	4.2	27,699	—	27,699	10.2	5.8	145,128	—	145,128	13.1	7.2
Feed grains and hay	21,030	—	21,030	3.7	2.7	17,974	—	17,974	6.7	3.7	112,280	—	112,280	10.1	5.6
Oil-bearing crops	46,422	0	46,422	8.2	5.9	28,638	78	28,716	10.6	6.0	116,509	4,080	120,589	10.8	6.0
Potatoes and sweet potatoes	4,460	—	4,460	0.8	0.6	3,191	—	3,191	1.2	.7	7,630	—	7,630	0.7	.4
Commercial vegetables for fresh market	18,318	—	18,318	3.2	2.4	20,391	—	20,391	7.5	4.3	59,924	—	59,924	5.4	3.0
Fruits	2,532	2,274	4,806	0.9	.6	6,515	1,605	8,120	3.0	1.7	10,682	1,326	12,008	1.1	.6
Total above	563,257	2,274	565,531	100.0		268,976	1,683	270,659	100.0		1,106,052	5,406	1,111,458	100.0	
Miscellaneous crops		5,047	5,047				4,130	4,130			—	14,326	14,326		
Other products		7,812	7,812				6,810	6,810			—	21,049	21,049		
All crops	563,257	15,133	578,390		72.2	268,976	12,623	281,599		56.7	1,106,052	40,781	1,146,833		55.3
Livestock and livestock products															
Meat animals	123,170	—	123,170	55.6	15.4	106,906	—	106,906	51.2	22.2	600,097	—	600,097	65.4	29.2
Dairy products	37,437	—	37,437	16.9	4.7	44,277	—	44,277	21.2	9.2	135,224	—	135,224	14.7	6.6
Poultry and eggs	42,535	199	42,734	19.3	5.4	33,105	199	33,304	15.9	6.9	138,852	1,288	140,140	15.3	6.8
Wool and mohair	18,247	—	18,247	8.2	2.3	24,375	—	24,375	11.7	5.0	42,257	—	42,257	4.6	2.1
Total above	221,389	199	221,588	100.0		208,663	199	208,862	100.0		916,430	1,288	917,718	100.0	
Other livestock		782	782				5,847	5,847			—	7,765	7,765		
All livestock	221,389	981	222,370		27.8	208,663	6,046	214,709		43.3	916,430	9,053	925,483		44.7
All farm products	784,646	16,114	800,760		100.0	477,639	18,669	496,308		100.0	2,022,482	49,834	2,072,316		100.0
Percent of total	98.0	2.0	100.0			96.2	3.8	100.0			97.6	2.4	100.0		

TABLE 6. COMPUTATION OF ALL-CROPS INDEX, MAY 1933

Subgroup	Percentage of cash receipts, 1924-29	Subgroup indexes, 1924-29 = 100	Extension
Cotton	77.3	41.4	3,200.22
Food grains	5.9	47.4	279.66
Feed grains and hay	3.7	48.0	177.60
Potatoes and sweet potatoes	.8	39.1	31.28
Oil-bearing crops	8.2	31.9	261.58
Fruits	.9	57.2	51.48
Commercial vegetables	3.2	82.7	264.64
	100.0	xxxx	4,266.46

All crops index

1924-29 = 100 (4266.46 ÷ 100) = 42.7
Factor (converts to 1910-14 = 100) = 1.5928
1910-14 = 100 (42.7 × 1.5928) = 68.0

lettuce, however, were added at link dates. Commodities or subgroups can be brought into the index at any time. The following example shows

TABLE 7. COMPUTATION OF ALL FARM PRODUCTS INDEX, MAY 1933

Major group	Percentage of cash receipts, 1924-29	Subgroup indexes, 1924-29 = 100	Extension
All crops	72.2	42.7	3,082.94
Livestock and livestock products	27.8	50.3	1,398.34
Total	100.0	xxxx	4,481.28

All farm products index

1924-29 = 100 (4481.28/100) = 44.8
Factor (converts to 1910-14 = 100) = 1.5565
1910-14 = 100 (44.8 × 1.5565) = 69.7

details of bringing sorghum grain prices into the feed grains and hay index in January 1917:

A = CB	A=Average 1917 monthly feed grains and hay aggregate including sorghum grain ($47,479,000).
$47,479,000 = (169.8773) ($27,949,000)	B=1924-29 base weight aggregate ($27,949,000).
D = EC	C=Average 1917 monthly feed grain and hay index including sorghum grain on 1924-29 = 100 base.
$30,396,000 = ($17,893,000) (169.8773)	D=Average 1917 monthly feed grains and hay aggregate excluding sorghum grain.
	E=New base weight aggregate to be used 1910-16 for feed grains and hay.

The group aggregate of $17,893,000 is used before sorghum grain was added in January 1917, and $27,949,000 for other years prior to the June 1933 link date.

A similar procedure was used for bringing the fruit and commercial vegetables for fresh market groups into the all-crops index in January 1924. Both groups were added at the same time to simplify computations.

ACKNOWLEDGMENTS

The authors express their appreciation to the clerical staffs of the Agricultural Estimates Division, Agricultural Marketing Service, U. S. Department of Agriculture, Austin, Texas, the Data Processing Center, Texas A&M College System and the Department of Agricultural Economics and Sociology of the Texas Agricultural Experiment Station for assistance in preparing this publication.